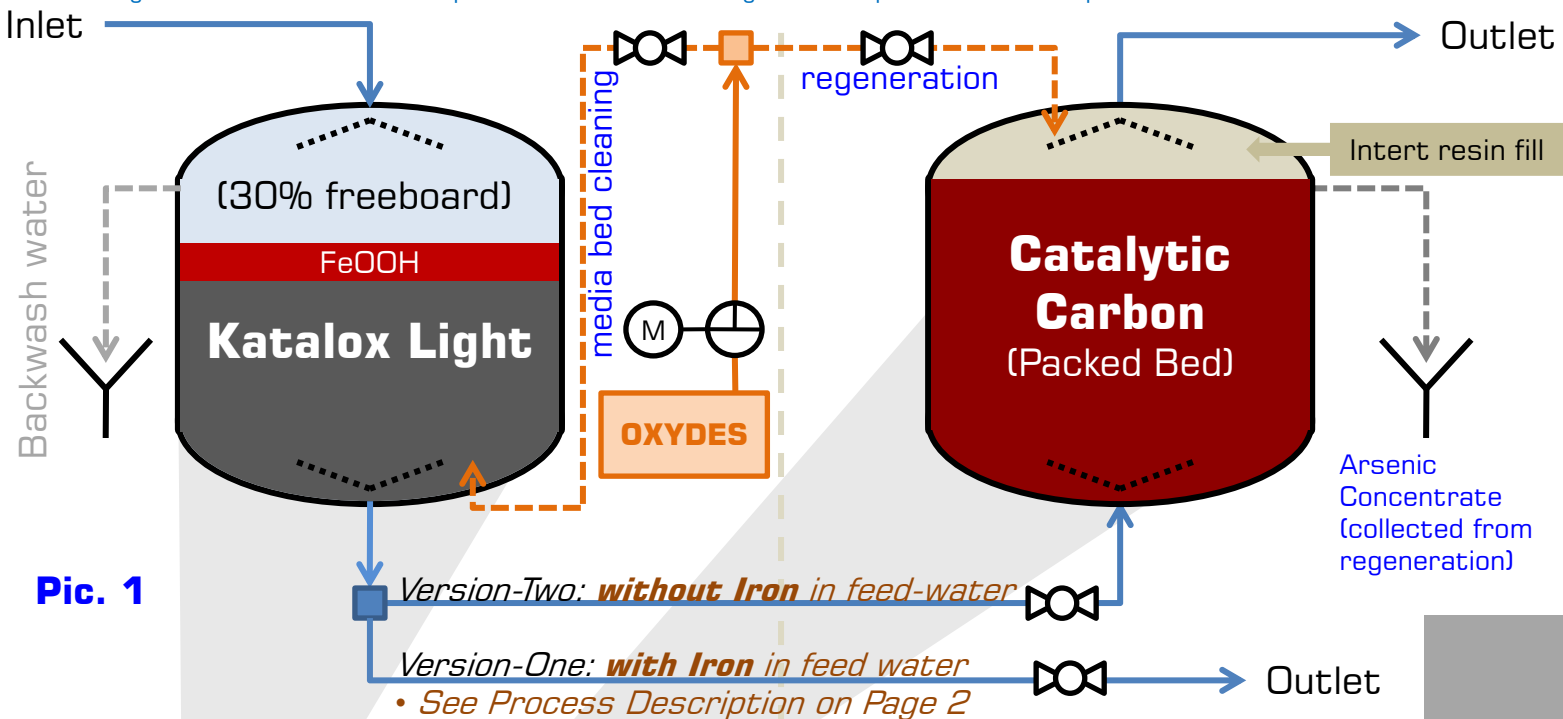


# ARSENIC - REMOVAL

## Katalox Light + Catalytic Carbon

### Adsorption:

The removal of contaminants through physical or chemical bonding on a surface is known as Adsorption. There are several types of adsorbents based on – Activated Alumina, Ferric Hydroxide, Titanium dioxide, Activated Carbon and other inorganic materials. The disadvantages of these adsorbent is that they can not be regenerated. This produces huge solid waste. Watch-Water produces less solid waste than all other adsorbents- as they can be regenerated. Concentrated liquid obtained from the regeneration process contains precious metals for reuse.



• See Process Description: Katalox Light (Page 2)

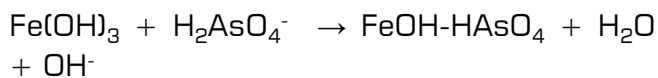
Watch-Water® Germany has developed an unique ferrous (Feroxyhyte) coconut-shell activated carbon and increased the surface 2500 m<sup>2</sup>/g or even more to remove many heavy-organic load-inorganic load including Bacteria and viruses. (See CC brochure). 99.9% of Arsenite can be removed at pH from 7 to 8 for an influent concentration of 5x10<sup>-5</sup> M As(III). Catalytic Carbon with ferric loading has the highest capacity of both As(III) and As(V)

## Process Description: Katalox-Light

**Katalox-Light** is a granular, catalytic filtration media developed and produced by Watch-Water GmbH. This very advanced engineered media product consists of 15% coated manganese dioxide (MnO<sub>2</sub>) on ZEOSORB core and is designed for very rush catalytic oxidation and splitting ions. Removal of Iron (Fe) and Manganese (Mn) from ground water, surface water and industrial circulation water for potable and water re-use applications. The media is Certified to NSF/ANSI 61 by WQA.

### Combined Fe/As Removal:

**Version One:** When Iron (Fe) present in the inlet/feed water, it precipitates as FeOOH, it acts as adsorbent for the chemisorptions of other metals such as Arsenate (AsO<sub>4</sub>) which is present in the water, the Iron/Arsenic reaction as follows:



Iron removal process with **Katalox-Light** with the above described process can be utilized for the combined removal of Fe and As from waters having Fe level x20 times than the Arsenic concentration. If this is satisfied **Katalox-Light** can remove the Arsenic concentration to less than 5µg/L, well below the EPA's new MCL. No Catalytic Carbon is needed in this case.

**Version Two:** Where the iron levels are not high enough to remove Arsenic the post treatment with **Catalytic Carbon (Arsenic Polishing)** is required. Typical system designs consists of 2 automated filters.

The 200 m<sup>3</sup>/h (Typ: 63x86) filters shown on **pic. 2** (page 1) in California is removing 10 mg/L of Fe and 8 mg/L of Mn on continuous basis (24-7, 365 days). It contains 11.2 m<sup>3</sup> (395 ft<sup>3</sup>) of **Katalox-Light** media.

Backwashing is done every 40 to 48 hours of operation. Backwash time: max 10 – 15 minutes.

*Keep in the Watch-Water's Novel thinking,  
this is the most simple method for Arsenic Removal.*

## Process Description: Catalytic Carbon

The Arsenic removal method shown in this brochure is using Packed Bed column with **Catalytic Carbon/Granular Ferric Carbon (GFC)**. Watch-Water® has developed this carbon whose surface is the highest and equal to Ferroxyhte. The **Catalytic Carbon** has a much greater affinity for Arsenic than all other adsorbents in the water treatment industry. Catalytic Carbon from Watch-Water possesses between 6 to 12 times greater capacity for Arsenic than FERROLOX or Activated Alumina. With an influent concentration of 50 µg/liter, 90,000 – 100,000 Bed-Volume can be treated before an effluent concentration of 10

µg/liter breakthrough happens. This Packed Bed does not require any Maintenance, Backwash, Rinse or Manpower. **Katalox-Light** pre-treatment is required to remove suspended solids, Iron, Manganese and other contaminants which are usually present at any existing water treatment plants all the world. And the highest advantage of **Catalytic Carbon** is, this can be regenerated and the extracted concentrate can be easily evaporated used for sales of metal. No other Adsorbent can remove Arsenic more effectively than Catalytic Carbon/Granular Ferric Carbon (GFC).

- ✓ Removal of phosphates and increased phosphorous, read the Brochure "Phosphate Removal with Catalytic Carbon". Watch-Water has concerns regarding Eutrofication.
- ✓ Boron Removal with Catalytic Carbon: Brochure Boron Removal
- ✓ Fluoride Removal with Catalytic Carbon: Brochure Fluoride Removal
- ✓ Cadmium Removal with Catalytic Carbon: Brochure Cadmium Removal

## Surface Chemistry and Surface Charge

Both Katalox-Light and Catalytic Carbon have very crystalline surface and very high surface area. As explained in the literature of Katalox-Light, Watch-Water has developed a technology to charge surfaces. Surface charge of Positive or Negative are very important for Adsorption. These parameters should have a suitable pH range for removal of Cations or Anion contaminants. The effect of the presence of cations (e.g. Calcium, Magnesium, Iron, Manganese, Copper, Chromium etc.) or Anions (e.g. Arsenate, Phosphate, Fluorides etc.). All adsorbents are manufactured with a [Surface Charge](#) and when brought into

contact with a polar material that is water. This charge arises from ionisation, ion adsorption or ion splitting at dissolution. An Electric double layer forms because ions of opposite charge (Counter ions) are attracted to the surface or similar charges (co-ions) are rejected from the material surface. So now it's easy to explain that high surface has higher micropores and mesopores and very less macropores. High surface is based on more micropores and less macropores. Higher the Surface area, Higher the surface charge of electric double layer.

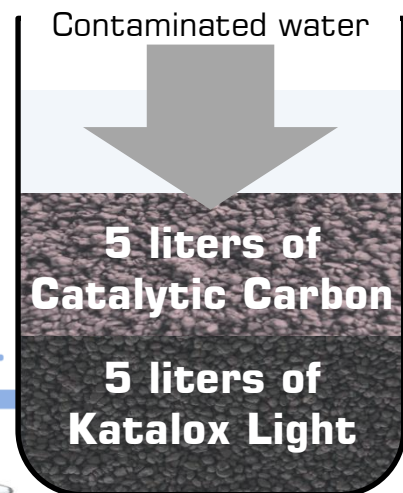
*Arsenic referred as "arsenikon"  
a Greek word meaning King of Poisons.*

## A BUCKET TREATMENT Unit:

Using a 5 liters of [Catalytic Carbon](#) and 5 liters of [Katalox-Light](#) can reduce Arsenic, Chromium, Copper, Fluorides and Phosphate levels to 5 or less microgram per liter at the treated water. This is also a method to remove highly contaminated waters with Uranium and Radionuclide. Regenerated media can be used [at least 50 to 60 times](#).

Total [OXYDES](#) volume to required for regeneration is 50 grams of the [INSTANT OXYDES](#) Powder.

Clean Drinking Water



Gravity filter

## Removal technologies

GFC improved arsenic removal media is an invention of [Watch-Water® Germany](#) that can remove heavy metals from contaminated waters. Our invention relates to a unique form of ferrihydroxide that effectively removes heavy metals such as arsenic from any liquid or water. Also other heavy metals for example Lead, Cadmium, Mercury,

Copper, Chromium, Antimony, Barium, Cyanide or Fluoride. In drinking water these heavy metals are considered detrimental to a person's health and in the case of infants, are believed to impede intellectual development. All industrial water streams must contain less than 0.5 mg of heavy metals before the water can be discharged.

**Catalytic Carbon** not only remove heavy metals but also improve taste, odor and smell of all drinking water by adsorbing ionic metals, organic molecules and colloidal particles and also remove high amounts of chlorine, chloramines and THM's

**Catalytic Carbon** the ***KING OF ADSORBERS*** can be used in point of use (POU), point of entry (POE), whole house systems or free standing one bucket treatments type devices. And for municipalities, industrial/commercial applications, **packed bed** systems are used worldwide.

### Important:

**Catalytic Carbon** the ferroxhyte coated GAC is dried in a very special way to contain a specific particle size, surface charge and highest surface area and maximum levels of Micro-porosity, Meso-porosity and minimum Macro-porosity to contribute the maximum loading of ferroxhyte which has ability to remove unwanted ions and unwanted compounds per unit weight than any conventionally made Ferric Hydroxide, Titanium Dioxide, Activated Alumina based (natural and synthetic) adsorbents. The worst about the conventional Ferric Hydroxide Adsorbent is it contains undesirable high amount of Moistures (such as 15 to 55 %) which is related to high costs of transport and cost of water in adsorbent. ***× Pay more- get less adsorbents.***

**Catalytic Carbon** is dry and has the highest surface and highest capacity. Loading dry media in either up-flow or down-flow or in an empty container (cartridge) application is much easier than moist or wet media.

**Example:** 10" Big-Blue cartridge loaded with **Catalytic Carbon** media removes 98 % of heavy metals and can treat 5000 gallons (19.000 liters) of heavy metals. The most common competing anions are sulfate, chloride and silicates. In **Catalytic Carbon** the presence of competing ions does not affect the removal characteristics of the **Catalytic Carbon**. Water can be treated with contaminants with a pH level from 6.5 to 9 without reducing capacity. Additionally, all levels of phosphates and fluorides can be removed with **Catalytic Carbon**.

The absorption capacity of 60 mg of **arsenic** per gram of **Catalytic Carbon** (60 gram/kg), which is higher than the capacities of other adsorbents.

## System Design Parameters

### Katalox-Light

Flow direction	Down-flow	
Inlet water pH	5.8 - 10.5	
Freeboard	25 - 35%	
Min. Bed Depth	US	29.5 inches
	SI	75 cm
Optimal Bed. Depth	US	47 inches
	SI	120 cm
Service flow	US	6 - 12 gpm/ft <sup>2</sup>
	SI	15 - 30 m/h
Backwash velocity	US	8 - 10 gpm/ft <sup>2</sup>
	SI	20 - 25 m/h
Backwash time	5 - 10 minutes	
Rinse time	1 - 2 minutes	

### Catalytic Carbon

Flow direction	Can be designed both Up-Flow (Packed Bed) and Down-flow	
System Freeboard (down-flow)	25 - 35%	
Filtration rate	10 - 30 BV/h (Maximum: 40 BV/h)	
Backwash velocity	10 - 20 m/h	
Bed Depth	80 - 100 cm (Maximum: 120 cm)	
EBCT	≥ 90 seconds	

• *Find more information in respective products technical brochures*

## Presented by:

**Watch Water®, Germany**  
A Water Company

Fahlachstraße 14, Mannheim, D-68165, Germany  
Tel: +49 621 87951-0  
Fax: +49 621 87951-99  
Email: info@watchwater.de